UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/028,778	12/28/2001	Hiroaki Tanaka	8004-1013	4276

466 7590 05/29/2008
YOUNG & THOMPSON
209 Madison Street
Suite 500
ALEXANDRIA, VA 22314

EXAMINER	
ERDEM, FAZLI	

ART UNIT	PAPER NUMBER
2826	

MAIL DATE	DELIVERY MODE
05/29/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/028,778	TANAKA ET AL.	
	Examiner	Art Unit	
	FAZLI ERDEM	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Amendment filed on 2/19/2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2,4,6,8-11 and 15-55* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *6,8,16,18,19 and 21* is/are allowed.

6)☒ Claim(s) *2,4,10,15,17,20, 22-29,33,35-41,43,46,49,52,54 and 55* is/are rejected.

7)☒ Claim(s) *9,11,30-32,34,42,44,45,47,48,50,51 and 53* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 2/19/2008 have been fully considered but they are not persuasive. In column 9, Fujikawa discloses that as the volume of nitrogen inside the mixing atmosphere increases, the content of nitrogen in TiN increases. Furthermore, also, in column 9, Fujikawa suggests that changing the nitrogen ratio to a different level would produce a different crystal structure of TiN film. Along with Fig. 7, as column 9 suggests, one could arrive at the required 25% or higher nitrogen content/concentration in a TiN film.

It is well understood in the art that in most known stable compounds of titanium nitride, the atomic percentage of nitrogen ranges from 37.5% to 55%. Note http://en.wikipedia.org/wiki/Titanium_nitride, where it is explained that according to published sources (for example L.E. Toth, Transition Metal Carbides and Nitrides (Academic, New York, 1971) stable compounds range in stoichiometry from $TiN_{0.6}$ to $TiN_{1.2}$, equivalent to nitrogen atom percentages of 37.5% to 55.4%. Note that the Examiner is not citing this Wikipedia article as an independent authority but simply in response to Applicant's assertion that the prior art fails to teach a "TiN film [which] itself has a nitrogen concentration of 25 atomic % or higher." It is true that neither Fujikawa or Shimada et al. state, in so many words, that the resultant nitrogen atom percentages of their films may range from 37.5% to 55.4%, but given the notorious nature of this fact they can hardly be faulted for failing to make a point of repeating it.

In the years that have past since the 1971 Toth reference cited in Wikipedia, many patent publications have described titanium nitride films with nitrogen concentrations higher than 25%. Among them are Snyder et al. 3,883,314 (TiN with 22.63 weight percentage, i.e. 49.5 atomic

percentage, nitrogen); Snyder 4,591,418 ("[because] the color of TiN varies according the atomic percentage of nitrogen therein, the color of the titanium nitride can be adjusted to approximate the color of a selected gold or gold alloy by adjusting the flow of nitrogen during the deposition [as Fujikawa does].... most colors of commercial interest can be approximated by titanium nitride in which nitrogen comprises 40 to 50 atomic percent"); Case et al. 5,008,217 (titanium nitride containing 45 to 55 atomic percent nitrogen); Sue et al. 5,071,693 (titanium nitride-containing compound having an atomic percent of nitrogen from 33% to 55%); and Sue et al. 5,185,211 (non-stoichiometric titanium nitride coating in which the atomic percent of nitrogen in the titanium nitride is between 32.5% and 47%).

Allowable Subject Matter

1. Claims 6, 8, 16, 18, 19, 21 allowed.

2. Claims 9, 11, 30, 31, 32, 34, 42, 44,45, 47, 48, 50, 51, 53, 54 and 55 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

3. The following is a statement of reasons for the indication of allowable subject matter: Prior art failed to establish a three layer TiN, Ti and Al conductive layer with Al in the bottom layer or four layer TiN, Ti and Al layer where Al is based in the lower middle layer.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 2,4,10, 15, 22-29, 33, 35-41, 43, 46, 49 and 52 rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. (6,661,476) in view of Shimada et al. (6,448,578) further in view of Fujikawa (6,414,738).

Regarding Claim 2 and 55, Abe et al. disclose a liquid crystal display device where in Figs 2, 4, 7, 9 and 11 it is disclosed an active matrix addressing LCD device comprising: an active matrix substrate dielectric plate 1, thin-film transistors G having a transparent, (TFTs) arranged on the plate 1, and pixel electrodes 2 arranged on the plate; gate electrodes G/9, of the TFTs having a first multilevel conductive structure 8/9/10; scan lines 41a/41b connected to the corresponding gate electrodes and having the first multilevel conductive structure; common electrodes 130, formed on the plate to be opposite to corresponding ones of said pixel electrodes; and common lines formed on the plate to be connected to corresponding ones of said common electrodes. Abe et al. fail to disclose the first and second multi-level structure including a TiN at top, Al in the middle and Ti in the bottom and the required nitrogen concentration of 25% or more for the TiN layer. However, Shimada et al. disclose a thin film transistor and liquid crystal display device where in Fig. 1 it is disclose 3 sets of multi-layer structure 4c/4b/4a, 3c/3b/3a and 9c/9b/9a where TiN at top (4c,3c,9c), Al layer in the middle (4b, 3b, 9b) and Ti layer in the bottom (4a, 3a, 9a). Furthermore, Fujikawa discloses a semiconductor display device where in Fig. 7 and in column 9, the required nitrogen concentration of higher than 25% is disclosed

It would have been obvious to one of having ordinary skill in the art the time the invention was made to include the required multi-layer conductive structure and the required nitrogen concentration in Abe et al. as taught by Shimada et al. in and Fujikawa, respectively,

order to have a liquid crystal display device with less film peeling and superior adhesion as disclosed in abstract section of Shimada et al.

Regarding Claim 4, in Fig. 1 of Shimada et al., TiN film 9c is exposed from the second multilevel conductive structure at the terminal 1.

Regarding Claim 10, in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Regarding Claim 15, in Fig1 of Shimada et al. TFTs comprises a gate insulating film 11 formed to cover the gate electrode, a semiconductor island 6, formed on the gate insulating film, a source electrode 7 formed on the island, a drain electrode 8 formed on the island to form a channel gap between the drain electrode and the source electrode.

Regarding Claim 17, in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Regarding Claim 20, in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Regarding Claim 22, in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Regarding Claim 23, in Figs. 2, 4, 7, 9 and 11, Abe et al. disclose common electrodes 130, formed on the plate to be opposite to corresponding ones of said pixel electrodes; and common lines formed on the plate to be connected to corresponding ones of said common electrodes.

Regarding Claim 24, in Fig. 1 of Shimada et al. pixel electrode 9c/9b/9a has a multiple layer.

Regarding Claim 25, in Fig. 1 of Shimada et al. pixel electrode 9c/9b/9a has a multiple layer.

Regarding Claim 26, in Fig. 1 of Shimada et al., TiN film 9c is exposed from the second multilevel conductive structure at the terminal 1.

Regarding Claim 27, in Fig. 1 of Shimada et al., TiN film 9c is exposed from the second multilevel conductive structure at the terminal 1.

Regarding Claim 28, in Fig1 of Shimada et al. TFTs comprises a gate insulating film 11 formed to cover the gate electrode, a semiconductor island 6, formed on the gate insulating film, a source electrode 7 formed on the island, a drain electrode 8 formed on the island to form a channel gap between the drain electrode and the source electrode.

Regarding Claim 29 and 55, in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Regarding Claim 33, in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Regarding Claim 35, in Fig. 1 of Shimada et al. source electrode 4 has 3 layers (4c/4b/4a) and drain electrode 8 has three layers (9c/9b/9a) and aluminum layer is the middle layer 4b/9b.

Regarding Claim 36, in Figs. 2, 4, 7, 9 and 11, Abe et al. disclose common electrodes 130, formed on the plate to be opposite to corresponding ones of said pixel electrodes; and common lines formed on the plate to be connected to corresponding ones of said common electrodes.

Regarding Claim 37, in Fig. 1 of Shimada et al. pixel electrode 9c/9b/9a has a multiple layer.

Regarding Claim 38, in Fig. 1 of Shimada et al., TiN film 9c is exposed from the second multilevel conductive structure at the terminal 1.

Regarding Claim 39, in Fig. 1 of Shimada et al., TiN film 9c is exposed from the second multilevel conductive structure at the terminal 1.

Regarding Claim 40, in Fig. 1 of Shimada et al., TiN film 9c is exposed from the second multilevel conductive structure at the terminal 1.

Regarding Claim 41, in Fig1 of Shimada et al. TFTs comprises a gate insulating film 11 formed to cover the gate electrode, a semiconductor island 6, formed on the gate insulating film, a source electrode 7 formed on the island, a drain electrode 8 formed on the island to form a channel gap between the drain electrode and the source electrode.

Regarding Claim 43, in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Regarding Claim 46, in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Regarding Claim 49 in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Regarding Claim 52 in Fig. 1 of Shimada et al., Al film is the middle layer 3c, 3b and 3a.

Conclusion

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FAZLI ERDEM whose telephone number is (571)272-1914. The examiner can normally be reached on M - F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)? If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

FE
May 23, 2008

/Thomas L Dickey/
Primary Examiner, Art Unit 2826